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RECEIVER-AMPLIFIER VACUUM TUBES

This book is designed primarily as a handbook for personnel engaged in the operation, adjustment, and repair of radio and television equipment and for radio amateurs. It is not highly theoretical but is chiefly for those who have a working knowledge of vacuum tubes. It should be noted that the book introduces a new system for designating tube types. The table of contents and pertinent extracts are presented below.

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System for Designation Vacuum Tubes

The type designations for vacuum tubes are determined by five designation positions in accordance with the following order:

Position 1 (number-rounded off) indicates: for receiving tubes--filament voltage; for cathode-ray tubes--diameter of screen, in centimeters

Position 2 (letter) indicates the purpose of the tube according to the following classification: without designation--receiving amplifying; GD transmitting, long wave (for wave lengths above 12 meters); GU--transmitting, ultra-short wave (for wave lengths from 12 meters to 50 centimeters); V--rectifiers; R--relay tubes and gas-discharge tubes designed primarily for overvoltage protection of electrical circuits; L--television, oscilloscope, and other special tubes in which deflection of an electron beam is employed.

Position 3 (letter) indicates the characteristic structural features of the tubes, according to the following classification: D--diode; Kh--twin diodes; S--triodes; E--tetrodes; P--pentodes and beam tetrodes; K--variable-mu pentodes and beam tetrodes; Zh--normal cut-off pentodes and beam tetrodes; A--frequency converting tubes with two control grids (pentagrid converters); R--triodes with one or two diodes; B--pentodes with one or two diodes; N--twin triodes; Ye--tuning indicators; G--gasotrons (gas-filled tubes); T--thyratrons; O--electrostatic cathode ray tubes; K--electromagnetic cathode ray tubes;

Position 4 (number) distinguishes dissimilar tubes which have the same designations in the remaining positions (1, 2, 3, and 5).

Position 5 (letter) designates the external structure of the tube, the type of cooling for high-power transmitting tubes, and the screen color for cathode ray tubes, according to the following classification: without designation--glass tubes; B--metal tubes; Zh--"acorn" tubes; P--miniature tubes; L--lock in tubes, cathode-ray tubes; B--white screen; S--blue screen, V--green screen; Zh--yellow-green screen; P--long-persistence screen; K-short--persistence screen.

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Examples of Designations

4S1--receiving tube, triode, filament voltage 4 volts
6K17B--metal receiving tube, pentode, filament voltage 6 volts
30VKh1--receiving tube, rectifying double diode (two-plate kenotron), filament voltage 30 volts
GUZh-2--pentode transmitting tube designed for transmitting ultrashort waves
VD6--high-voltage rectifying diode (kenotron) since it is not a receiving tube
VG7- rectifier, gas-filled
RT1--relay thyratron
8L01V- electrostatic cathode-ray tube, green screen, diameter 8 centimeters

Alphabetical Index of Old and New Designations for Receiving Tubes

New	*Old	New	*Old
0.3B17-35	--	6Zh17B	6SJ7
0.3B65-35	--	6K1P	9003
1VD1	1V, 1	6K1Zh	956
1A1P	--	6K7B	6K7
1B1P	--	6K9	6K9M, 6SK7-GT
1K1P	--	6K17B	6SK7
2A1	SB-242, 2A1M	6N1P	6J6
2Zh2	2Zh2M	6N7	6N7, 6N7
2Zh4	SO-257	6N8	6SN7GT
2K2	2K2M	6N9	6SL7ST (T.N.-GT)
2N1	SO-243, 2N1M	6P2	6V6, 6V6S (Q)
2P1	2P1M, SOB-244	6P3	6L6S (GX), 6L6
2P1P	--	6P6B	6F6, 6F6
2P3	2P2N, SB-258	6R7B	6G7, 6Q7
2S2	UB-240, 2S3M	6R17B	6SQ7
2S3	2A3	6S1Zh	955
4S4	UO-186	6S2B, 6S2	6J5
5L01-V	2AP1,LO-238	6S4B	6F5, 6F5
5VKh3	5U4-S(T.N.5U4-G)	6S5B	6C5
5VKh2	5Ts3-S (5Ts3-G)	6S6	6B4-S (T.N.6B4G)
5VKh1	5Ts4-S, 5Z4	6S1P	9002
6A5B	6L7, 6L7	6Kh6B	6Kh6, 6H6
5A8B	6A8	6Vkh1	6X5S (6X5G)
6A10	6SA7GT	12P6B	12A6
6A1B	6SA7	18LK1B	LK-715
6DP1	6PR-20	30P1	30P1M
6DP5	6P5	30VKh1	30Ts6C
6Ye5	6E5	30VD1	30-Ts1M
6Zh4B	6AG7	GUZh-1	G-411
6Zh5P	6AG5	GUZh-2	807
6Zh7B	6Zh7, 6J7	GUZh-3	1625
6Zh8	Z-62-D	VD8	2X2 (879)
6Zh11B	6SH7	RT5	884
6K12B	6SG7	7S85-30	VR-75
6Zh14B	6AC7, 1852	10S85-30	VR-105
6K15B	6AB7, 1853	15S85-30	VR-150

* In some cases both Russian and American designations are used.

Chapter II. High Frequency Pentodes and Converters

The 2Zh2 is a sharp cut-off pentode designed primarily for amplification of radio and audio frequencies and for detection in battery-powered units. In Class A amplification, it operates with 120 volts plate voltage and 0.5 watts plate power dissipation. This pentode may also be used as a mixer with a separate oscillator, or as a detector, or audio frequency amplifier. If two of these tubes are used in push-pull, undistorted output power up to 0.1 watts can be obtained.

The 1K1P is a variable-mu pentode. It is a miniature tube, designed primarily for controlling radio-frequency amplification in battery-powered units. The plate current is 1.8 milliamps at 90 volts when used as a Class A amplifier; its transconductance is 0.75 milliamps per volt.

The 2K2 is a variable-mu pentode designed primarily for controlling radio-frequency amplification in battery-powered units. It has an external cap for connection to the control grid and its maximum power output is 0,5 watts.

The 6Zh8 is a sharp cut-off pentode designed primarily for wide-band amplification. When used as a Class A amplifier, its maximum power output is 2.5 watts. Its characteristics are very similar to those of the 6AC7.

The 1A1P is a miniature pentagrid converter designed primarily for frequency conversion in battery-powered superheterodyne receivers. The maximum plate voltage and cathode current are, respectively: 90 volts and 5.5 milliamps.

The 2A1 is another pentagrid converter designed primarily for battery-powered superhet receivers. Its maximum power output is 0.7 watts with 160 volts on the plate. This tube is especially sensitive to over-heating, which decreases its length of service considerably. Therefore, the filament voltage should not be higher than 1.8 - 1.9 volts.

Chapter III. Triodes, Twin Triodes, and Duplex Diode-Triodes

The 2S2 is a directly heated, medium-mu triode designed primarily for detection and amplification of audio frequencies in battery-powered units. When used as a voltage amplifier, its transconductance is 1.55 milliamps per volt. The maximum plate voltage and power output for this tube are, respectively; 160 voltage and 0.6 watts.

The 1B1P is a miniature diode-pentode used primarily as a plate detector and preliminary audio-frequency amplifier in battery-powered units. Its transconductance is 0.625 milliamps per volt, and, when used as a Class A amplifier, its plate current is 1.6 milliamps at 68 volts.

The 2N1 is a twin triode with a common heater, used primarily for a.f. power amplification in battery-powered units. It is a high-mu tube (32) and the transconductance for each triode is 0.8 milliamps per volt. The maximum plate voltage and power output are, respectively; 160 volts and 1.5 watts. It can be used in all types of combined arrangements, for example: as a grid detector and audio-frequency amplifier, or as a grid detector and second oscillator for receiving telegraph signals.

Chapter IV. Tubes for Power Amplification

The 4P4 is a triode with a low amplification factor (4) designed primarily for audio-frequency power amplification. When used as a Class A amplifier, it develops 1.5 watts at 250 volts, having a transconductance of 3.2 milliamps per volt. When used as a Class AB amplifier, it develops 7.5 watts at 400 volts.

The 2P1P is a miniature pentode designed for audio-frequency power amplification in battery-powered units. When used as a Class A power amplifier, it develops 0.27 watts at 90 volts. Its transconductance is 2.15 milliamps per volt.

The 2P1 and the 2P3 are both directly heated pentodes, designed for audio-frequency power amplification in battery-powered units. The tubes are identical in size and use the same sockets, but the 2P3 is the more powerful and is used when the amount of current drawn is not the primary consideration. The 2P3 has a power output of 0.45 watts at 160 volts, drawing 320 milliamps filament current. The 2P1 develops 0.15 watts at 120 volts, drawing 185 milliamps filament current.

The 2Zh4 is a pentode used as an oscillator or radio-frequency power amplifier in battery-powered units. It is basically designed for operation as a low-power oscillator in portable transceiver sets. It may be used, however, in the audio-frequency output stage in receivers when the current drawn from the battery does not have to be taken into consideration (filament current is 275 milliamps).

The 30P1 is an indirectly heated beam tetrode used for audio-frequency power amplification in AC-DC units. Its transconductance is either 9 or 10 milliamps per volt, depending on whether 110 or 200 volts is applied to the plate. The maximum voltage and power at the plate are, respectively, 210 volts and 7 watts.

The GUZh-1 formerly the G-411, and the G-412 are similar in construction, but have slightly different parameters. The G-412 has been discontinued. The GUZh-1 is used primarily as a Class C amplifier in transmitting very high frequencies (up to 50-75 megacycles. It can also be used as a sweep oscillator in television units. The maximum plate dissipation and maximum voltage are, respectively, 20 watts and 400 volts.

Chapter V. Auxiliary Tubes and Cathode-Ray Tubes

The 30VKh1 is a two-section (two plates, two cathodes) rectifier designed for AC-DC equipment. When used as a voltage doubler, it can supply up to 90 milliamps at 180-200 volts from a 110-volt AC line.

The 30VD1 is a half-wave rectifier used in transformerless units. The maximum inverse peak voltage and the peak plate current are, respectively, 500 volts and 500 milliamps.

The ballast tubes 0.3B17-35 and 0.3B65-135 are used for filament current regulation. The tungsten resistance wire is connected between pins 3 and 4 in the "35" and between pins 3 and 5 in the "135." The "35" is used in operating the Moskvich receiver from 110-volt line, and is replaced by the "135" when operating from a 220-volt line. In the first case, the rectifier is used as a voltage doubler, and in the second case, as a half-wave rectifier.

The 18LK1B is an electromagnetic kinescope for television receivers using 343-line scanning. It used 3,500 volts on anode No 2, and the cutoff grid voltages vary from -40 to -60 volts. Variations on the 18LK1B are the 18LK3V, which uses a green, instead of a white, screen, and the 18LK2B, which is designed for television receivers using 625-line scanning.

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